Canadian Meteorological and Oceanographic Society
Société canadienne de météorologie et d'océanographie

CMOS HALIFAX CENTRE

Winds of Change: Evolution of the El Nino Southern Oscillation (ENSO) from the Last Ice Age to Today

by

Andrew Bush
Department of Earth and Atmospheric Sciences
University of Alberta

Wednesday, September 27, 2006 at 10:00 am
Bedford Institute of Oceanography, Needler Boardroom, Dartmouth, NS.

Abstract

The El Nino Southern Oscillation (ENSO) is a dominant mode of temporal variability in the coupled atmosphere-ocean system. It induces global temperature and precipitation anomalies that affect global food production, disease spread, and wildfire activity. Although the coupled dynamics underlying ENSO are relatively well understood, there have been observed changes in ENSO frequency and amplitude over the Earth's recent past that remain unexplained yet are crucial to long-term predictions of ENSO in any global change scenario.

A sequence of numerical simulations are performed with a coupled atmosphere-ocean general circulation model configured for various times in Earth's recent past in order to better understand the dynamic factors that control ENSO period and intensity. From the last Ice Age (approximately 21,000 years ago) to today, simulations suggest that ENSO events increased in amplitude and decreased in frequency. An additional simulation with doubled atmospheric carbon dioxide indicates that this trend continues in a warmer climate. A comparison to linear stability analyses of the coupled atmosphere-ocean system reveals that such changes in ENSO are entirely consistent with the simulated changes in strength of the climatological easterly trade winds over the tropical Pacific Ocean. The dynamic and thermodynamic mechanisms that regulate tropical trade wind speed are therefore discussed with an emphasis on how these mechanisms were likely different in the Earth's past. Finally, we discuss the numerical results in the context of observational data and of the numerical methods that are used to solve the dynamic and thermodynamic equations.

Contacts

Rick Danielson, Dalhousie University: rick.danielson@phys.ocean.dal.ca (494-3371)
Yuri Geshelin, BIO: gesheliny@mar.dfo-mpo.gc.ca